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Specification

Cylinder for a Rotary Press

The invention relates to a cylinder in accordance with the preamble of claim 1 or 6.

A temperable cylinder for a rotary printing press is known from DE 197 12 446 A1, wherein a heat exchanger consisting of several tubes is arranged inside a hollow chamber of the cylinder and in turn is surrounded by a heat-transferring stationary fluid.

EP 0 557 245 A1 discloses a temperable forme cylinder with a clamping conduit extending axially over the jacket surface, wherein conduits extending axially in respect to the cylinder have been cut into the cylinder in the vicinity of the periphery, through which coolant flows.

EP 0 733 478 B1 shows a friction roller embodied as a tube, wherein coolant flows through the entire hollow space between an axial conduit, through which coolant is conducted, and the tube.

A temperable double-jacket drying cylinder is known from DE-PS 929 830. Steam flows in the space between an outer jacket and an inner jacket, into which ribs have been cut in a spiral pattern.

The object of the invention is based on creating a cylinder of a rotary printing press.

In accordance with the invention, this object is attained by means of the characteristics of claims 1 or 6.

The advantages which can be achieved by means of the invention lie primarily in that a temperable cylinder can be produced in a cost-effective manner from simple components. By means of this a pre-selectable temperature is achieved, which is

(Sub Spec filed)

almost evenly distributed over the entire jacket surface of the cylinder. A temperature profile which fluctuates in the circumferential direction or is uneven, such as can occur, for example, in connection with individual axially extending conduits and/or with wall thicknesses which are too small in comparison with the distance of the conduits, is avoided.

In an advantageous embodiment a chamber through which a tempering medium is conducted is of such dimensions in the radial direction on the inside of the cylinder jacket, that a forced flow also takes place directly on the jacket surface.

A low wall thickness of the outer body separating the jacket surface and the tempering medium is particularly advantageous in respect to the fastest possible reaction time of the tempering process, for example for inking rollers, in particular screen or anilox rollers, or for forme, transfer or satellite cylinders without a device for fastening dressings, such as bracing or clamping conduits, extending radially into the interior of the jacket surface.

In a preferred embodiment a wall thickness of a temperable forme or transfer cylinder having one or several clamping or bracing conduits on its shell surface is so great that the clamping conduit comes to lie entirely inside the wall.

Tempering which is even in the circumferential and the axial directions is achieved by means of a tempering medium flowing in the axial direction through a narrow gap between the outer body and the base body of the cylinder on the entire circumference.

In a further advantageous embodiment, an even more strongly directed flow is generated by means of a groove extending spirally on the outer surface of the base body.

Cooling by means of the above mentioned spiral conduit is furthermore advantageous, in particular for screen or anilox rollers, wherein the outer body is supported on the strips and is therefore constructed with thin walls.

Exemplary embodiments of the invention are represented in the drawings and will be described in greater detail in what follows:

Shown are in:

Fig. 1, a longitudinal sectional view through a temperable cylinder, which has a device for fastening a dressing and with a spirally extending conduit,

Fig. 2, a cross section through a temperable cylinder in accordance with Fig. 3,

Fig. 3, a longitudinal sectional view through a temperable cylinder, which has a device for fastening a dressing and with a gap between the base body and the outer body,

Fig. 4, a longitudinal sectional view through a temperable, thin-walled cylinder with a spirally extending conduit,

Fig. 5, a cross section through a temperable cylinder in accordance with Fig. 4,

Fig. 6, a longitudinal sectional view through a temperable cylinder with a gap between the base body and the outer body.

A temperable cylinder 01 of a printing press, in particular a rotary printing press, has a cylinder base body 02, for example of a tube-shape or solid, which is surrounded by an outer cylinder body 03 of a circular cross section, for example a tube 03.

On its ends, the cylinder base body 02 is fixedly connected with respective journals 04, 06, which are rotatably seated by means of bearings 07 in lateral frames 08, 09. It is possible to connect one of the journals 04, 06, for example the right journal

06, with a drive motor or a drive wheel, not represented, fixed in place on the frame.

The other journal 04 has an axial bore 11, which receives a conduit 12 as the feed line 12 for a liquid or gaseous tempering medium, for example CO_2, water, oil, etc. In an advantageous embodiment, the axial bore 11 of the journal 04 has an interior diameter d11 which is greater than an exterior diameter d12 of the conduit 12. Therefore a removal line 13 of a circular cross section remains open in the area of the journal 04 and around the conduit 12, through which the tempering medium leaves the cylinder 01 again via the journal 04. The conduit 12 for supplying the tempering medium extends from the left journal 04 almost axially through the cylinder base body 02 as far as the right journal 06 and terminates in radially extending bores 14. The bores 14 terminate in a distributing chamber 16, which extends around the entire circumference on the inside of the outer cylinder body 03. From the distributing chamber 16 the tempering medium flows in the axial direction A through at least one conduit 17 arranged between the cylinder base body 02 and the outer cylinder body 03 to the left journal 04, where it terminates in a collecting chamber 18 and reaches the ring-shaped removal line 13 via radially extending bores 19.

The supply line 12 and the removal line 13 are connected with the removal and supply flow of a tempering device, not represented.

It is provided by an embodiment variation, not represented, to provide the supply and removal of the tempering medium separately via the respective journals 04, 06.

In a first exemplary embodiment (Fig. 1), the cylinder 01 is embodied as a forme cylinder 01 or transfer cylinder 01 which,

on a shell surface 21 of the outer cylinder body 03, has at least one fastening device 22, for example a bracing conduit 22, a magnet close to the shell surface, or other means, extending axially in respect to the cylinder 01, for fastening a dressing, for example a printing forme or a rubber blanket. The wall thickness h03 of the outer cylinder body 03 is greater than the depth h22 of the bracing conduit 22, so that an uninterrupted and circular surface 23 is formed on the inside of the outer cylinder body 03, which makes possible a cost-effective construction and above all even tempering. The wall thickness h03 lies, for example, between 40 and 70 mm, in particular between 55 and 65 mm, wherein the depth h22 of the bracing conduit 22 lies between 20 and 45 mm. In Figs. 1 and 2 two bracing conduits 22 are provided in the circumferential direction of the cylinder 01, however, the upper bracing conduit 22 is only sketched in for reasons of clarity.

In this exemplary embodiment the conduit 17 is embodied as a spiral groove 17 in the axial direction A on a circumference 24 of the cylinder base body 02. This spirally turning groove 17 of a width b17 and a depth h17 is covered by means of the outer cylinder body 03, for example by being shrunk on, wherein the surface 23 of the outer cylinder body 03 rests on a protrusion 26 forming the groove 26, for example a strip 26 of a width b26.

The groove 17 is connected at its start 27 with the distributing chamber 16 and at its end with the collecting chamber 18. The distributing chamber 16 and the collecting chamber 18 are for example each designed as an annular groove 16, 18, each of which is formed by a shoulder on the circumference of the area of the journals 04, 06 near the cylinder base body and a front face

of the cylinder base body 02, and is also covered by the outer cylinder body 03.

In the case of a forme cylinder 01 of double-sized circumference, i.e. two printing formats in the circumferential direction, the diameter of the forme cylinder 01 is for example between 320 and 400 mm, in particular 360 to 380 mm.

The depth h17 and width b17 of the groove 17, as well as the width b26 of the strip 26, and the number of conduits 17 determine the flow-through amount per unit of time, and alternatingly the required pressure as well as the lead of the spiral groove 17, and therefore the tempering behavior.

In an advantageous embodiment, the circumference 24 of the cylinder base body 02 has several, for example four or eight, grooves 17 in the distributing chamber 16 and the collecting chamber 18, the starts 27 and ends 28 of each are offset by 90° or 45° in the circumferential direction. In this way, with the same conduit geometry a multiplex-threaded, for example quadruply- or octuply-threaded groove 17, has an increased total cross section Q, i.e. the sum of the cross sections of the conduits 17, and an increased lead S, and therefore also a reduced flow path and lesser pressure loss.

In the example, the circumference 24 of the cylinder base body 02 has a quadruply-threaded conduit 17, wherein the width b17 of the groove 17 respectively lies between 10 and 20 mm, for example at 15 mm, and the width b26 of the strip 26 respectively between 3 and 7 mm, for example at 5 mm. The depth h17 of the conduit 17 is respectively 10 to 15 mm, for example 12 mm. The quadruply-threaded conduit 17 therefore has a lead S of, for example, 52 to 108 mm, in particular of 80 mm.

A total cross section Q for the flow of the tempering medium is advantageously 600 to 800 mm². If increasing the wall thickness h03 of the outer cylinder body 03, while at the same time retaining the cylinder diameter d01 and reducing the inner radius r17 of the spiral groove 17, the depth h17 of the groove 17 must be increased at the same ratio as the inner radius r17 of the groove 17 is reduced, so that the total cross section Q remains at least at the order of magnitude, for example greater than or equal to 710 mm². In this way the supply to, or removal of heat from a shell surface 21 of the forme cylinder 01 remains assured. For the determination of the total cross section Q, the approximate inner radius r17 should be applied for depths h17 which are small in comparison with the inner radius r17, otherwise as usual the inner radius r17 plus half the depth h17. The ratio between the tempered shell surface 21 and the total cross section Q lies for example between 1000 and 1800 mm².

In a second exemplary embodiment (Fig. 3) of a forme cylinder 01, the conduit 17 is produced not as a spiral groove 17, but as an open gap 17 with an annular clear profile between the cylinder base body 02 and the outer cylinder body 03. The supply and removal of the tempering medium takes place in the same or similar way as in the first exemplary embodiment (Fig. 1). In place of the radially extending bores 14, the journal 04, ~~08~~ 06 is embodied in several pieces and in this way permits the penetration of the tempering medium from the supply line 12 into the distributing chamber 16, or from the collection chamber 18 to the removal line 13. In the exemplary embodiment, the supply line 12 is embodied in a two to four two-piece manner, wherein a conduit 12 penetrating the journal 04 terminates in a conduit leading through the cylinder base body 02.

The clearance h17 of the gap 17, together with an inner radius r17 of the rotary shaft of the cylinder 01 on which the gap 17 is arranged, determines the flow conditions and therefore also the tempering behavior. Too narrow a clearance increases the required pressure, or reduces the amount of flow-through, while to large a clearance might not result in the assured direction of the flow directly onto the surface 23 of the outer cylinder body 03 because of high centrifugal forces occurring and friction occurring in the area of the surface 23 in the course of the rotation of the cylinder.

In an advantageous embodiment of a forme cylinder 01, the gap 17 is arranged at the inner radius r17 of 80 to 120 mm, in particular between 100 and 115 mm. The clearance h17 of the gap is between 2 to 5 mm, preferably 3 mm. The wall thickness h03 of the outer cylinder body 03 is designed to be between h03 = 40 mm and h03 = 70 mm, in particular between 55 and 65 mm. In this embodiment of the tempering device, the outer cylinder body 03 should be designed to be self-supporting over a length 101, for example 101 = 800 to 1200 mm, of the barrel of the cylinder 01, or a length 103, for example 103 = 800 to 1200 mm, of the outer cylinder body 03. Thus, with a depth h22 of the bracing conduit 22 between 20 and 45 mm, a sufficient strength of the outer cylinder body 03 remains in the area of the bracing conduit 22. As in the first exemplary embodiment, the clearance h17 of the gap should be increased in an advantageous manner at the ratio of a reduction of the inner radius r17 if the wall thickness h03 is increased and the gap 17 is moved further into the interior of the cylinder 01, and vice versa. For example, the total cross section Q lies between 1300 and 3500 mm^2. The ratio between the shell surface 21 to be tempered and the total cross section Q of the

conduit 17 lies in this embodiment between 300 and 900 mm^2, for example, and in particular between 500 and 650 mm^2. The remaining preferred dimensions of the forme cylinder 01 explained in the first exemplary embodiment should also be employed with the second exemplary embodiment and will not be stated again.

In a third and a fourth exemplary embodiment (Figs. 4 and 6), the cylinder 01 is embodied as a temperable roller 01, for example an inking roller 01, in particular a screen roller 01 or anilox roller 01. The supply and removal of the tempering medium, as well as the seating in lateral walls 08, 09 takes place in the same or similar manner as in the first or second exemplary embodiments.

In the third exemplary embodiment (Fig. 4) a spiral-shaped, multiplex-threaded, preferably octuply-threaded, conduit 17 is arranged on the circumference 24 of the cylinder base body 03, the same as in the first exemplary embodiment. The distributing chamber 16 and the collecting chamber 18 each have eight radial bores 14, 19 and are connected, equidistant in relation to the circumferential direction, with eight starts 27 and eight ends 28. In the example, the conduits 17 have been embodied as grooves 17 with segment-like, for example semicircular profile, for advantageous mechanical and satisfactory flow properties.

The multiplex-threaded conduit 17 is embodied in an advantageous manner as octuply-threaded, since it is possible with the same geometry of the conduit 17 to either conduct twice the amount of tempering medium at a steady pressure loss through the conduit 17, or the same amount of tempering medium at a reduced pressure.

As in the first exemplary embodiment, the groove 17 is covered by means of the outer cylinder body 03, which is for

example shrunk on. Tempering by means of the spiral-shaped groove 17 is particularly advantageous in case an effective and fast reacting tempering of the outer cylinder body 03 is required, such as is represented by ink-conducting inking rollers 01 and screen rollers 01. The less the wall thickness h03 of the outer cylinder body 03 (Fig. 5), the faster the reaction on the shell surface 21 takes place in case of a change of the operating temperature. In the example, the outer cylinder body 03 is made with a very small wall thickness h03 and not self-supporting, i.e. it is supported on strips 26. The width of the groove 17 determines the mechanically still permissible wall thickness h03 of the outer cylinder body 03, and vice versa. The permissible width b26 of the strip 26 and the minimum wall thickness h03 determine each other mutually, since a temperature profile on the shell surface 21 of the outer cylinder body 03 should be avoided if possible.

In an advantageous embodiment the temperable roller 01 has a diameter d01 between 160 and 200 mm, in particular 180 mm. The wall thickness h03 of the outer cylinder body 03 is 1 to 4 mm, for example h03 = 2 mm (not counting a coating of a total of 200 to 400 μm possibly to be applied), the length l03 of the outer cylinder body 03 lies between 800 and 1200 mm. A ratio V between the length l03 and the wall thickness h03 lies, for example, between 200 and 1200 mm, in particular between 400 and 1000 mm. In the area which acts together with the surface 23 of the outer cylinder body 03, the strip 26 has a width b26 of 2 to 4 mm, in particular b26 = 3 mm. In the area which acts together with the surface 23 of the outer cylinder body 03, the conduit 17 has a width b17 between 8 and 13 mm, in particular 10 to 12 mm. In the example, the profile of the conduit 17 is semicircular-shaped, so that a maximum depth h17 of the conduit 17 is 4 to 7 mm, in

particular h17 = 5 mm. The total cross section of the octuply-threaded conduit 17 comes to 300 to 450 mm², and can be approximately compared to the total cross section Q in the quadruply-threaded first exemplary embodiment, if the shell surface 21 to be cooled is taken into consideration. Here, too, an increase of the amount of tempering medium flowing per unit of time and, if possible, of a contact surface of the temperature medium with the surface 23 of the outer cylinder body 03, should at least be kept at an order of magnitude where the geometries of the roller 01 change while the shell surface 21 to be cooled remains the same. The ratio between the shell surface 21 to be tempered and the total cross section Q lies, for example, between 1200 and 1600 mm².

In the fourth exemplary embodiment (Fig. 6), the cylinder 01 embodied as a roller 01 has a gap 17, which is annular in profile, as the conduit 17, comparable with the second exemplary embodiment. As in the third exemplary embodiment, the roller 01 has a diameter d01 of approximately 160 to 200 mm, wherein the supply and the removal of the tempering medium is designed in accordance with one of the previous exemplary embodiments.

In contrast to the third exemplary embodiment, the outer cylinder body 03 here is embodied to be self-supporting over the length 101 of, for example 800 to 120 mm, and has a wall thickness h03 of 5 to 20 mm, for example, in particular 5 to 9 mm. The clearance h17 of the gap 17 is 2 to 5 mm, preferably 3 mm, wherein the gap 17 is arranged on an inner radius of 60 to 100 mm, in particular 80 mm. The total cross section Q through which flow occurs lies, for example, between 1000 and 2500 mm², in particular at approximately 1500 mm². The ratio between the shell surface 21 to be tempered and the total cross section Q of the conduit 17

lies, for example, between 200 and 600 mm^2, in particular between 300 and 500 mm^2.

The roller 01, preferably designed as a screen roller 01, from the third and the fourth exemplary embodiments can have profiling on its shell surface 21, for example ink-conducting small cups. On the shell surface 21 of the outer cylinder body 03 it can preferably have a chromium-nickel coating and a ceramic coating, each of a thickness of 100 to 200 μm, wherein the latter has the profiling, or the small cups.

It is advantageous for the embodiments of tempering by means of a spiral-shaped conduit 17 to select the ratio between the shell surface 21 to be tempered and the total cross section Q of the conduit 17 between the cylinder base body 02 and the outer cylinder body 03 through which a flow occurs to be less than 2000 mm^2, in particular between 1800 and 1000 mm^2. In an advantageous manner the width b26 of th strip is less than or equal to twice, and in particular one and one half times, the wall thickness h03 of the outer cylinder body 03.

The design of the outer cylinder body 03 is particularly advantageous, wherein it is a thin-walled tube 03 of a wall thickness d03 less than or equal to 5 mm, in particular less than 3 mm, which is mechanically supported on the strips 26, which are spaced apart in the axial direction A.

The arrangement for tempering represented in the third exemplary embodiment can in an advantageous further development also be a forme cylinder, which has no fastening device, such as is the case, for example, when using printing sleeves in place of printing plates, or with shell surfaces 21 of forme cylinders 01, on which images are directly placed. There, too, a directed, fast

reacting tempering in accordance with the third exemplary embodiment is then also advantageous.

List of Reference Symbols

01 Cylinder, forme, transfer cylinder, roller, inking, screen, anilox roller
02 Cylinder base body (01)
03 Outer cylinder body (01)
04 Journal (02)
05 -
06 Journal (02)
07 Bearing
08 Lateral frame
09 Lateral frame
10 -
11 Axial bore
12 Supply line, conduit
13 Removal line
14 Bore, radial
15 -
16 Annular groove, distributing chamber
17 Conduit, grove, gap
18 Collecting chamber, annular groove
19 Bore, radial
20 -
21 Shell surface (03)
22 Fastening device, bracing conduit
23 Surface (03)
24 Circumference (02)
25 -
26 Protrusion, strip

27	Start (17)
28	End (17)
b17	Width (17)
b26	Width (26)
d01	Diameter (01)
d11	Inner diameter (11)
d12	Outer diameter (12)
h02	Wall thickness (02)
h03	Wall thickness (03)
h17	Depth, clearance (17)
h22	Depth (22)
l01	Length (01)
l03	Length (03)
r17	Inner radius (17)
A	Axial direction (01)
Q	Total cross section
S	Lead
V	Ratio (l03, h03)